

Remarks

Claims 1-27 have been previously withdrawn, claims 28 and 31 have been cancelled and claims 29, 30, 32 and 33 have been amended. Claims 29, 30 and 32-46 are pending in the application. Applicant respectfully requests reconsider in view of the following remarks.

More particularly, claims 29 and 30 have been amended to depend from claim 32, claim 32 has been rewritten in independent form to include the limitations of cancelled claims 28 and 31 and claim 33 has been written in independent form to include the limitations of cancelled claim 28. In addition, claims 32 and 33 have been amended to recite "An electronics interface for interfacing a multiplexed photo array comprising at least one channel output with an ultrasound console." (Emphasis added).

Claim Rejections Under 35 U.S.C. § 102

Claims 29 and 30 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kannegundla et al. (U.S. 5,523,788).

Claims 29 and 30 have been amended to depend from claim 32, which was rejected under 35 U.S.C. § 103(a). Therefore, the 35 U.S.C. § 102(b) rejection of claims 29 and 30 has been rendered moot, and the patentability of these claims will be addressed with regard to the U.S.C. § 103(a) rejection of claim 32.

Claim Rejections Under 35 U.S.C. § 103

Claims 32-46 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kannegundla et al. (U.S. 5,523,788) as applied to claims 28-30 and further in view of Fujimoto (U.S. 5,588,434). Applicant respectfully traverses.

In accordance with M.P.E.P. § 2143, in order to "establish a prima facie case of obviousness, three basic criteria must be met." First, some suggestion or motivation in the prior art references or in the knowledge of one of ordinary skill in the relevant art must exist to modify or combine the references. Second, if the references are combined, a reasonable expectation of success must be shown. Then, finally, all of the claim limitations must be taught or suggested by one reference or a combination of references.

With regard to claim 32, neither Kannegundla nor Fujimoto, alone or in combination,

disclose, teach or suggest an electronics interface for interfacing a multiplexed photo array with an ultrasound console comprising at least one channel processor having an input coupled to an output channel of the multiplexed photo array and a digital-to-analog converter having an output coupled to the ultrasound console. An advantage of the electronics interface of the invention is that it enables an ultrasound console that is configured to only process ultrasound images to also process images taken with a multiplexed photo array. As is well known in the art, a multiplexed photo array is made up of photo detectors that convert incident light into electrical signals, whereas the ultrasound transducer of (4) of Fujimoto electro-acoustically converts an ultrasonic wave into an electrical echo signal (see column 5, lines 44-53 of Fujimoto).

To begin, it would not have been obvious to one skilled in the art to combine the teachings of Kannegundla and Fujimoto, much less in a way that renders the electronics interface of claim 32 obvious. This is because Kannegundla and Fujimoto are directed to different types of imaging systems. Kannegundla is directed to a color imaging system that processes an image signal from an image sensor (28) comprising an array of pixels elements (e.g., 1024X1024 array of pixel elements), in which each image signal corresponds to the amount of radiation incident thereon (see column 1, lines 7-11 and column 3, lines 12-17 of Kannegundla). In contrast, Fujimoto is directed to an ultrasonic diagnostic apparatus that processes an ultrasonic wave that is returned from living tissue and electro-acoustically converted by an ultrasonic transducer (4) into an electrical echo signal (see column 5, lines 44-53 of Fujimoto). Therefore, it would not have been obvious to one skilled in the art to combine the teachings of Kannegundla and Fujimoto.

Not only would it not have been obvious to one skilled in the art to combine the teachings of Kannegundla and Fujimoto, it would not have been obvious to one skilled in the art how to combine or modify Kannegundla with Fujimoto. This is because the systems of Kannegundla and Fujimoto are configured to process different types of signals. The color imaging system of Kannegundla is configured to process an image signal from an array of pixels elements, whereas the ultrasonic diagnostic apparatus of Fujimoto is configured to process an ultrasonic wave that is electro-acoustically converted into an electrical echo signal. Neither Kannegundla nor Fujimoto, alone or in combination, disclose, teach or suggest to one skilled in the art how to combine or modify the color imaging system of

Kannegundla with the ultrasonic diagnostic apparatus of Fujimoto.

Furthermore, the motivation suggested by the Examiner for modifying Kannegundla by the teaching of Fujimoto is misplaced. Kannegudla is directed to a color imaging system that processes an image signal from an image sensor (28) comprising an array of pixels elements, which is different from an ultrasound diagnosing apparatus (see column 1, lines 7-11 and column 3, lines 12-17 of Kannegundla). Because the color imaging system of Kannegudla is not related to an ultrasound diagnosing apparatus, one skilled in the art would not have been motivated "to have modified Kannegudla by the teaching of Fujimoto in order to provide an ultrasound diagnosing apparatus which offers a substantially less degraded image without the need for correction by an operator even when the image is degraded due to movement of a body to be diagnosed or of the transducer unit."

With regard to claim 32, the motivation suggested by the Examiner does not explain why one skilled in the art would modify Kannegundla to include a "digital-to-analog converter having an input coupled to the output of the memory buffer" "wherein the digital-to-analog converter is coupled to an ultrasound console." The color imaging system of Kannegudla is simply not designed for or capable of ultrasound imaging or diagnosis. Simply modifying Kannegudla to include a digital-to-analog converter and an ultrasound console does not change this. Thus, one skilled in the art would not have been motivated to modify Kannegudla by the teaching of Fujimoto.

For at least the reasons given above, the combined teachings of Kannegudla and Fujimoto neither disclose, teach nor suggest the electronics interface of claim 32. Therefore, applicant submits that claim 32 is patentable and earnestly requests allowance of claim 32.

Claims 29 and 30, as amended, depend from claim 32 and are therefore patentable for at least the reasons given for claim 32.

With regard to claim 33, neither Kannegundla nor Fujimoto, alone or in combination, disclose, teach or suggest an electronics interface for interfacing a multiplexed photo array with an ultrasound console comprising "a controller coupled to an ultrasound motor encoder for synchronizing the electronics interface and the multiplexed photo array with an

ultrasound console."

As discussed above, it would not have been obvious to combine the teachings of Kannegudla and Fujimoto because Kannegudla are directed to different imaging systems. Kannegudla is directed to a color imaging system that processes an image signal from an array of pixel elements, whereas Fujimoto is directed to an ultrasound diagnosis apparatus that processes an ultrasonic wave that is electro-acoustically converted by an ultrasonic transducer into an electrical echo signal. Further, it would not have been obvious to one skilled in the art how to combine or modify Kannegudla with Fujimoto because the systems of Kannegudla and Fujimoto are configured to process different types of signals.

Furthermore, with regard to claim 33, Fujimoto does not disclose "a controller coupled to an ultrasound motor encoder for synchronizing the electronics interface and the multiplexed photo array with the ultrasound console." The section of Fujimoto (column 6, lines 7-15) relied upon by the Examiner does not mention a multiplexed photo array, much less a controller coupled to an ultrasound motor encoder for synchronizing a multiplexed photo array with an ultrasound console. No where does Fujimoto disclose, teach or suggest a controller coupled to an ultrasound motor encoder for synchronizing a multiplexed photo array with an ultrasound console. Because this element of claim 33 is missing from Fujimoto and Kannegudla, claim 33 is not rendered obvious by the combined teachings of Fujimoto and Kannegudla.

For at least the reasons given above, the combined teachings of Kannegudla and Fujimoto neither disclose, teach nor suggest the electronics interface of claim 33. Therefore, applicant submits that claim 33 is patentable and earnestly requests allowance of claim 33.

With regard to claim 34, claim 34 depends from claim 33, and is therefore patentable for at least the reasons given for claim 33. Claim 34 is additionally patentable because Fujimoto does not disclose "wherein the controller instructs each one of the channel outputs of the multiplexed photo array to sequentially output the signal from each one of its respective plurality of photo detectors when the controller receives an encoder pulse from the ultrasound motor encoder." No where does Fujimoto disclose its ultrasound control unit (2) instructing the output channel of a multiplex photo array. The ultrasonic transducer (4) of Fujimoto relied upon the

Examiner as disclosing a multiplexed photo array is not a multiplexed photo array. Furthermore, the section of Fujimoto (column 7, lines 26-42) relied upon by the Examiner does not mention a multiplexed photo array, much less instructing the output channel of a multiplexed photo array. This section of Fujimoto discloses a "video memory" (22) and a "D/A converter" (23) that "superimposes the synchronizing signals from the TV signal generator circuit 27 onto video data that is already coordinate converted (from polar to rectangular coordinates) by the video memory 22, and the resulting signal is converted into an analog signal" (see column 7, lines 36-40). The operations of the "video memory" (22) and the "D/A converter" (23) of Fujimoto have nothing to do with instructing the output channel of a multiplexed photo array. Therefore claim 34 is patentable for the additional reason that Fujimoto does not disclose "wherein the controller instructs each one of the channel outputs of the multiplexed photo array to sequentially output the signal from each one of its respective plurality of photo detectors when the controller receives an encoder pulse from the ultrasound motor encoder."

Claims 35-46 depend ultimately from claim 34 and are therefore patentable for at least the reasons given for claim 34.

CONCLUSION

Based on the foregoing remarks, Applicant submits that the pending claims are patentable over the prior art and in condition for allowance. Should the Examiner have any questions regarding this matter, he is invited to call the undersigned at his convenience.

Respectfully submitted,

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